<u>What is claimed is:</u>

Claim 1. Apparatus for evaluating electric motors of the type having a rotatable armature mounted within a rigid housing according to noise characteristics generated by said motors during operation thereof comprising:

a support for receiving motors in a test location;

an electrical connection proximate said location for placing motors in said location in an operating condition;

a transducer adapted to be disposed in exclusive energy transfer relation with a motor housing in said test location and responsive to the noise characteristics produced during operation of a motor when so disposed to produce an output signal quantity; and

a processor for receiving and analyzing said signal quantity as a basis for identifying unacceptably noisy motors.

Claim 2. Apparatus as defined in Claim 1 wherein the transducer is a piezoelectric pickup.

Claim 3. Apparatus as defined in Claim 2 wherein the piezoelectric pickup includes a magnet for attaching the pickup to a ferromagnetic motor housing.

Claim 4. Apparatus as defined in Claim 2 wherein the apparatus further comprises a transport mechanism including a clamp for positioning the piezoelectric pickup proximal a motor housing and releasing the pickup when in contact with the motor housing.

Claim 5. Apparatus as defined in Claim 1 wherein the transducer comprises a laser disposed proximal the test location and having an output beam adapted to be aimed at a motor housing in the location, the processor comprising means for deriving Doppler-shift related frequency components from said signal

quantity as a result of periodic movement of a motor housing toward and away from the laser.

Claim 6. Apparatus for testing window regulator motors of a type having a rotatable armature mounted within a rigid housing according to noise characteristics produced by said motors during operation thereof comprising:

a support for receiving window regulator motors in a test location;

an electrical connection for connecting said window regulator motors to a source of electrical energy to operate same;

a transducer disposed in exclusive energy transfer relationship with the motor housing when in the test location and responsive to the noise characteristics produced by the motor housing to produce an output signal quantity; and

a processor connected to receive said signal quantity for deriving data therefrom to be used as a basis for sorting acceptable from unacceptable motors.

Claim 7. Apparatus as defined in Claim 6 wherein the transducer is a piezoelectric pickup.

Claim 8. Apparatus as defined in Claim 7 wherein the piezoelectric pickup includes a magnet for attaching the pickup to a motor housing.

Claim 9. Apparatus as defined in Claim 7 wherein the apparatus further comprises a transport mechanism including a clamp for positioning the piezoelectric pickup proximal a motor housing and releasing the pickup when in contact with the motor housing.

Claim 10. Apparatus as defined in Claim 6 wherein the transducer comprises a laser disposed proximal the test location and having an output beam

adapted to be aimed at a motor housing in the location, the processor comprising means for deriving Doppler-shift related frequency components from said signal quantity as a result of periodic movement of a motor housing toward and away from the laser.

Claim 11. Apparatus for evaluating window regulator assemblies of the type comprising a slide and carrier plate according to noise generated during operation thereof comprising:

a support for receiving window regulator assemblies in a test location;

a drive for causing the carrier plate to travel along the slide of said assembly;

a transducer adapted to be disposed in exclusive energy transfer relationship with the window regulator assembly and responsive to noise produced during travel of the carrier plate along the slide to produce a signal quantity related to such noise;

and a processor for receiving and analyzing said signal quantity for a basis for identifying unacceptably noisy window regulator assemblies.

Claim 12. Apparatus as defined in Claim 11 wherein the assembly is a piezoelectric pickup.

Claim 13. Apparatus as defined in Claim 12 further including apparatus for attaching the pickup to the carrier plate for travel therewith during operation of the window regulator assembly.

Claim 14. Apparatus as defined in Claim 13 wherein the attaching apparatus comprises a hanger and a detachable bracket, the pickup being carried by the detachable bracket.

Claim 15. Apparatus as defined in Claim 14 further including a dragline attached to the detachable bracket for imposing a weight load thereto simulating a window.

Claim 16. Apparatus as defined in Claim 11 wherein the drive comprises a reversible electric window regulator motor attached to the carrier plate by cables.

Claim 17. Apparatus as defined in Claim 11 wherein the support comprises a pallet and a conveyor removing the pallet into and out of a test station.

Claim 18. Apparatus as defined in Claim 17 further including a memory unit attached to the pallet for receiving pass/fail data regarding window regulator assemblies carried by said pallet and subjected to test in said test location and a transmitter connected to said processor for transmitting pass/fail information to the memory unit.

Claim 19. Apparatus for evaluating window regulator assemblies of the type having an electric drive motor and a slide/carrier plate assembly connected to the motor by cables such that operation of the motor causes the carrier plate to travel along the slide comprising:

the support for receiving window regulator in the test location;

an electrical connected proximate said location for placing electric motors in said location in an operating condition;

a first transducer adapted to be disposed in energy transfer relationship with a motor in the test location and responsive to the noise characteristics produced during operation thereof to produce a signal quantity having a primary periodic component based on motor rotation speed and other periodic components resulting from motor characteristics producing noise;

a second transducer adapted to be disposed in energy transfer relationship with the slide/carrier plate assembly of the window regulator and

responsive to noise produced thereby during travel to produce a second signal quantity; and

a processor for receiving and analyzing the first and second signal quantities as a basis for identifying unacceptably noisy window regulator assemblies.

Claim 20. Apparatus as defined in Claim 19 wherein the first and second transducers are piezoelectric pickups.

Claim 21. Apparatus as defined in Claim 19 wherein the first transducer is a laser transceiver.

Claim 22. Apparatus as defined in Claim 19 further comprising a magnet connected to the first transducer for attaching said transducer to a ferromagnetic motor housing.

Claim 23. Apparatus as defined in Claim 19 further comprising a hanger and a detachable support bracket detachably supported by said hanger and further wherein the second transducer comprises a magnet for detachably attaching the second transducer to the detachable bracket.

Claim 24. A method of evaluating electric motors of the type having a rotatable armature mounted within a rigid housing according to noise characteristics generated by the motor during operation thereof comprising the steps of:

supporting the electric motor in a test location;

connecting the electric motor to a source of electrical power to operate same;

aligning a transducer in energy transfer relationship with the motor housing and producing a signal quantity having a primary periodic component

based on the rotation speed of the motor armature and other periodic components resulting from motor characteristics producing noise; and

processing the signal quantity to identify unacceptably noisy motors.

Claim 25. A method of evaluating window regulators of the type having a reversible electric motor connected to a slide/carrier plate according to noise characteristics generated by the window regulator during operation thereof comprising the steps of:

supporting the window regulator on a base;

operating the window regulator with a simulated glass load;

developing at least one signal quantity related to noise produced by the window regulator during operation thereof; and

processing the signal quantity to identify unacceptably noisy window regulators.

Claim 26. The method as defined in Claim 25 wherein the step of generating at least one signal waveform comprises the sub-steps of:

attaching a first accelerometer to the window regulator motor; and

attaching a second accelerometer to the carrier plate.